

\*ARMY Declass/Release Instructions On File\*

ANNEX I

ARMY POSITION ON CAPABILITY OF  
CHINESE COMMUNIST RAILROADS

29 January 1954

1. Problem: To determine the maximum volume of freight which can be moved by China's railroads within the present traffic pattern. It is assumed that current performance is equal to capacity.

2. Basic Formula: Tons originated = (Operable car park - pooled cars) x average load per loaded car x  $\frac{365}{\text{Turnaround time}}$

3. Operable Car Park: It is estimated that the Chinese operable freight car park consists of approximately 40,000 operable units. This figure is derived from a 1949 statement accepted by the working group,<sup>1</sup> and takes into account cars destroyed, retired, and acquired since 1949.<sup>2</sup>

4. Average load per loaded car: It is estimated that average load per loaded car is 24 metric tons.

a. Average rated capacity of Chinese freight cars is believed to be 30 tons.<sup>3</sup> Average rated capacity of cars was 28.7 tons in Nationalist China in 1936<sup>4</sup> and 29.8 tons in unoccupied China in 1941.<sup>5</sup> Average rated capacity of Manchurian cars was 31.0 tons in 1942.<sup>6</sup> Manchurian cars comprised approximately 60% of the 1945 car park. It is believed that imports since 1945 have consisted largely of cars with 30 ton or higher rated capacity. An average rating of 30 tons is corroborated by the Kowloon car count.

b. In the period 1933-1936, the Chinese Nationalists normally loaded to 80% of capacity.<sup>7</sup> In 1947, car loading capacity was 80% utilized on the Canton-Hankow line, indicating the use of similar loading techniques in the postwar period.<sup>8</sup> In Manchuria, average tons per loaded car-kilometers was 25 in 1939 and 27.8 in 1942.<sup>6</sup> If this is the equivalent of average load per loaded car, an 80% utilization of car capacity (31 tons) is indicated for 1939, a 90% utilization for 1942. It has been reported that the estimated average car utilization in the USSR is 80.5% of freight car capacity.<sup>9</sup> It is believed that the Chinese Communists are loading no less efficiently than

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their Nationalist predecessors, and that 1939 levels in Manchuria are being attained. An 80% loading appears reasonable by Soviet standards, and was considered possible by JIC.<sup>10</sup>

c. The Chinese Communist press has reported that loading innovations designed to increase utilization of freight car capacity have been introduced on the railway system. Since such reports are fragmentary in nature and of questionable reliability, the effectiveness of these new techniques cannot be judged. However, to the extent that they have been successful, the average load per loaded car will be increased.

5. Turnaround time: It is estimated that turnaround time on China's railways is 5.2 days.

a. Formulae for determining turnaround time:

$$1. \text{ TRT} = \frac{\text{operable car park}}{\text{daily car loadings}}$$

$$2. \text{ TRT} = \frac{\text{average length of haul} + \text{distance per empty car}}{\text{average speed between division stops}}$$

$$\text{plus } \frac{(\text{av length of haul} - \text{av dist per empty car} - 1)}{\text{interval between division stops}} \times$$

average division stopping time plus terminal time

(includes classification, switching, loading or unloading)  $\times 2$

In the absence of a reliable figure for daily carloadings, formula 2 has been used to calculate turnaround time on China's railroads.

b. Average length of haul: The working group has accepted for working purposes minimum and maximum average length of hauls of 454 and 640 kilometers respectively.<sup>11</sup> The figure 454 is derived from Communist statistics by dividing ton kilometers (59.5 billion) by tons transported (131 million). This calculation is based on the assumption that by tons transported the Chinese mean tons originated. If 131 million is tons hauled, however, tons originated would be less than 131 million, and on the basis of 59.5 ton kilometers, average length of haul will be greater than 454 kilometers. The figure 640 km is an estimate based on JIC examination of the rail network and the current rail traffic pattern.

c. Ratio of empty to total movement: The working group has accepted for working purposes a ratio of 30% empty to total freight car movement.<sup>12</sup> This compares with a ratio of 37% on prewar Nationalist railways operating on a "home route system",<sup>5</sup> 26.32% on the limited network of unoccupied China

in 1941,<sup>5</sup> 28.8% on the Soviet railways, and approximately 25% on the compact Manchurian network in 1939-1942.<sup>13</sup> It was estimated by a former Chinese railway official in 1946 that the ratio in postwar China, freed from the restrictions of a home-route system, would be approximately 30%.<sup>5</sup> This estimate appears reasonable, based on Chinese historical performance and achievements in the Soviet Union. Applying a 30% ratio, average distance per empty car is 274 km for a 640 km average length of haul and 194 km for a 454 km average length of haul. Total distance per turnaround is thus 914 km for a 640 ALH, 648 km for a 454 ALH.

d. Average speed between division stops: Average speed between division stops is estimated at 20 kph. Comparable prewar speed on China's railways was 22.61 kph in 1934, 26.67 kph in 1935.<sup>5</sup> Speed between division stops on Soviet railways in 1950 was 20.1 kph. Speed on Manchurian railways in 1942 was 18.5 kph.<sup>6</sup> Communist performance figures<sup>14</sup> indicate that a speed near 20 kph, is frequently attained. JIC<sup>15</sup> has indicated that a speed of 25 kph between division stops, although probably high for China, is considered possible.

e. Interval between division stops is estimated at approximately 150 kms. This was the average interval on prewar China's railroads.<sup>5</sup> JIC<sup>15</sup> has indicated that 100 mile or 160 km is a normal division length; 100 miles has previously been accepted as an average length of a division for general planning purposes.

f. Division stopping time: Average division stopping time is approximately six hours. The working group has accepted this figure as conforming to normal and reasonable railway procedure.<sup>12</sup> JIC<sup>15</sup> and CIA<sup>16</sup> have both made use of this figure.

g. Terminal time: Terminal time (including classification, switching, loading or unloading) is estimated to average 25 hours per operation. Terminal time in Nationalist China in 1934 can be computed to be 25.72 hours.<sup>17</sup> Similarly, terminal time in Manchuria in 1942 can be computed at 25.65 hours.<sup>18</sup> JIC in calculating car utilization implies that 24 hours is a reasonable average period of time for terminal classification, switching, loading or unloading.<sup>15</sup> CIA<sup>16</sup> believes that Chinese Communist statistics indicate an average of 15 hours is allowed for stopping time at terminals. If this time excludes switching (6 hours) and loading or unloading operations (4 hours),

total estimated terminal time would be 25 hours.

h. Computation: Applying turnaround formula 2:--

$$1. 454 \text{ ALH: } \text{TRT} = \frac{454}{25} + \frac{190}{150} + \frac{(454 + 190 - 1) \times 6}{150} +$$

$$25 \times 2 = 102.3 \text{ hours or } 4.2 \text{ days}$$

$$2. 640 \text{ ALH: } \text{TRT} = \frac{640}{25} + \frac{274}{150} + \frac{(640 + 274 - 1) \times 6}{150} + 25 \times 2 =$$

$$326.2 \text{ hours or } 5.2 \text{ days}$$

6. Pooled cars: Pooled cars are cars withdrawn from the turnaround cycle to await assignment or for running repairs. A reasonable figure for pooled cars and one generally accepted by military planners is 10% of the car park. Thus, in China the number of pooled cars at any one time will be 4000 or 10% of 40,000.

7. Application of basic formula (Paragraph 2):

$$1. \text{Tons originated} = 40,000 - 4000 \times 24 \times \frac{365}{4.2} = \text{approx. } 75,082,000$$

$$2. \text{Tons originated} = 40,000 - 4000 \times 24 \times \frac{365}{5.2} = \text{approx. } 60,653,000$$

If the railways of China originated 75.1 million tons and have an average haul of 454 km, total ton kilometers will be 34.1 billion. However, an average haul of 454 km was computed on the basis of 59.5/ton kilometers. Thus, the minimum haul of 454 km is not supportable by the above methodology and conclusions.

If the railways originated 60,653,000 tons and average haul is 640 km, total ton kilometers will be 38.8 billion. It has been suggested that 59.5 billion may represent gross ton kilometers. It is possible also that 59.5 billion may represent tons originated multiplied by total freight car mileage. An originated tonnage of 60.65 million times 914 total loaded and empty haul equals 55.4 billion. Although use of this type of computation in determining ton-kilometers is apparently without precedent, it may be noted that there is a mere 7% variation between 55.4 and 59.5 billion.

8. Statement on Communist Statistics: It may be noted that Communist traffic figures appear to be internally consistent, and if 2.9 day turnaround, 25.2 kph speed, and 237.3 average daily distance per freight car are accepted,

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131 million tons of freight transported can be construed as 131 million tons of freight originated. If each of 40,000 cars is loaded every 2.9 days, car loadings will be approximately 13,790 per day or 5,033 million per year. At an average load of 26.1 tons per loaded car, the system could thus originate 131 million tons of freight. With an average length of haul of 454 km, a 34% ratio of empty to total movement, and a speed of 25.2 kilometers per hour between division stops, running time in one turnaround period would be 27.3 hours, detention time 42.3 hours. However, if division stops of 6 hours at 150 kilometer intervals are assumed, terminal time is 20.7 hours, or an improbable 10.35 hours per terminal.

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1. TSC - WG Minutes 1
2. See Tab A to Army's Annex
3. TSC - WG Minutes 3
4. China, Min Railways, Statistics for 1935-36
5. Ling, Chuks, China's Railway Rolling Stock; 1946
6. SMR, Annual Railway Statistics, 1942
7. Ling, Chuks and Min Railways Statistics for 1935-36: Computed by dividing car rated capacity kilometers by ton-kilometers.
8. Liu, C.S., A Comparison of Transportation Capacity and Efficiency of the Canton-Hankow Railroad and the Illinois Central System, in AmConGen, Hankow No. 2, 2 March 1949
9. TSC - WG Minutes 5, Annex A
10. JIC 635/1, p. 42
11. TSC - WG Minutes 7 and 8
12. TSC - WG Minutes 10
13. Computed from Japanese statistics
14. Listed in CIA Preliminary Draft CIA/RR 0.11
15. JIC 635/1
16. C/Preliminary draft, CIA/RR 0.11
17. Ling, Chuks: Computed as follows: Detention time, 19.15 hours x 3 detentions per 150 km ALH = 57.45 hrs. Less 1 division stop at 6 hrs. = 51.45 hours for two terminals or 25.72 hours for each terminal.
18. Computed as follows: Loaded plus empty haul: 451 km. Divided by av speed between division stops: 18.5 kph = 24.5 hours travel time. Add 12 hours (2 division stops of 6 hrs. ea.) = 36.5 hrs. TRT: 87.8 hrs less 36.5 hrs = 51.3 hrs or 25.65 hrs per terminal.

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TAB A  
to  
ANNEX I

## ARMY CAR PARK ESTIMATE, 1 JANUARY 1953

1. Car Park, 17 October 1949	30,000 operable	9,600 out of service	<u>1/</u>
2. Inventory of Additional Cars, 8 March 1950	3,088 serviceable (33,088)	7,190 out of service	<u>2/</u>
3. Damaged freight cars rehabilitated by October 1951	11,494	(44,582)	<u>3/</u>
4. New freight cars built by October 1951	1,419	(46,001)	<u>3/</u>
5. Production, 1952 and last 3 months of 1951	2,250	(48,251)	<u>4/</u>
6. Imports from Soviet Bloc	1,400	(49,651)	<u>5/</u>
7. Less net Korean losses 7,000		(42,651)	<u>6/</u>
8. Normal retirement 1,000		(41,651)	<u>7/</u>
9. Cars out of service for normal repairs 1,666 (9,666)		(39,985)	<u>8/</u>
Estimated Car Park, 1 January 1953		39,985	

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1/2/ Peking, NCNA, Dispatch, 8 March 1950.3/ People's Handbook, 1950, U, Minister of Railways T'eng Tai-yüan's to the People's Political Consultative Conference, 31 October 1951. These cars were presumably drawn from the pool of 16,790 cars reported out of service in lines 1 and 2. It is assumed that the 9,600 figure in line 1 and the 7,190 figure in line 2 do not overlap and that rehabilitated cars in line 3 do not include cars damaged in Korea.4/ CIA production estimates.5/ Mean figure: 700-2,200. Preliminary draft, CIA/RR 0.11, page 28. S.6/ Working group estimate computed as follows: Total cars destroyed in Korea to May 1953, 15,000 (CINCPAC Dispatch); adjusted by working group to 13,000 as of 1 January 1953; less 6,000 North Korean cars destroyed (Total North Korean park 12,000, less 6,000 estimated minimum needed for operations in North Korea). Cars reported damaged by CINCPAC are assumed to have been repaired.7/ Working group estimate: 2% retirement for 15-month period.8/ Working group estimate: 4% of total park, 1 January 1953.